CLINICAL CASE

Colonic perforation during percutaneous nephrolithotomy: prevention, diagnosis and treatment

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ABSTRACT

Although colonic perforation is an extremely rare complication of percutaneous kidney surgery, with a 1% incidence, it can have potentially serious consequences. The objective of this article is to emphasize the most important points for the prevention, diagnosis and management of this serious complication by presenting an illustrative case.

Prevention is based on adequate preoperative evaluation and the identification of high-risk patients. Among the most important risk factors are: advanced age and abnormalities such as horseshoe kidney. Early diagnosis and treatment are extremely important since approximately 85% of cases can be managed conservatively. However, strict vigilance should be carried out in order to detect any sign of clinical deterioration such as peritonitis or sepsis and thus establish aggressive and opportune treatment.

Key words: colon perforation, percutaneous nephrolithotomy, complications.

RESUMEN

Aunque la perforación colónica es una complicación en extremo rara de la cirugía percutánea renal con incidencia menor a 1%, puede tener consecuencias potencialmente graves. El objetivo de este trabajo es destacar mediante un caso ilustrativo los aspectos más importantes para la prevención, diagnóstico y manejo de esta seria complicación.

La prevención se basa en una evaluación preoperatoria adecuada con la identificación de pacientes de alto riesgo. Los factores de riesgo más importantes son, entre otros, la edad avanzada y las anomalías anatómicas como el riñón en herradura. El diagnóstico y tratamiento temprano son de extrema importancia ya que casi 85% de los casos puede tratarse de forma conservadora. Ello implica instaurar una vigilancia estrecha para detectar cualquier signo de deterioro clínico como peritonitis o sepsis y en tal caso establecer un tratamiento agresivo y oportuno.

Palabras clave: *perforación del colon, nefrolitotomía percutánea, complicaciones, México.*

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INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is considered to be a safe and effective technique for renal lithiasis treatment.[1] However, it is an invasive procedure with a wide-ranging index of adverse effects from 3-83% according to different researchers. The majority of these complications are not clinically significant, such as minor bleeding, postoperative fever or blood transfusion. The frequency of major complications such as septicemia, renal hemorrhage requiring surgery or injury to adjacent organs such as the liver, spleen or colon is much lower. Undoubtedly one of the most feared complications is colonic perforation and although its incidence is extremely low (0.2-0.8%), it can have serious consequences such as septicemia, peritonitis and the formation of abscesses and nephrocolonic or colocutaneous fistulas.[2,3] The objective of this article is to illustrate a case of colonic perforation that was conservatively resolved and provide a literature review of risk factors for this complication along with its diagnosis, treatment and prevention.

CASE PRESENTATION

The patient is a 76-year-old male with a 2-month progression of intermittent colicky pain in the right flank associated with macroscopic hematuria. Excretory urogram showed a 2.5 cm calculus in the right renal pelvis. The patient underwent right PCNL in ventral decubitus position. Kidney was accessed through a puncture towards the inferior calyx guided by fluoroscope. The stone was fragmented through a 28 Fr tract by pneumatic lithotripsy and was completely extracted. At the end of the procedure a 20 Fr nephrostomy catheter was placed.

Twenty-four hours later the patient presented with pain at the puncture site accompanied with 38.5° C fever and leakage of fecal matter from the percutaneous tract. Physical abdominal examination was normal. Laboratory test reported leukocyte count of 18,600 cells/ mm^3 and computed axial tomography (CAT) showed the passing of the nephrostomy through the ascending colon (**Image 1**). Under fluoroscope control the nephrostomy catheter was tractioned toward the ascending colon converting it into a colostomy catheter (**Image 2**). The patient received intravenous wide-spectrum antibiotic treatment for 14 days and a low-fiber diet with adequate clinical response. Fourteen days after catheter repositioning it was removed and the patient was released. At 10-month follow-up the patient is stone free and with no signs of colorenal or colocutaneous fistula.

DISCUSSION

Early diagnosis and appropriate treatment is imperative for limiting morbidity. Colonic perforation is an extremely rare complication of percutaneous renal surgery with an incidence below 1%. Its incidence is low because the abnormal retrorenal position of the colon is very uncommon.[4]

Through CAT images, Hadar et al.[5] discovered that 0.6% of individuals can have a retrorenal colon. Hopper et al.,[6] also through CAT imaging in a controlled prospective study, showed that in supine decubitus position retrorenal colon has a 1.9% incidence and can increase to 4.7% when the patient is in the ventral decubitus which is a commonly used position in percutaneous renal surgery.

In previously published reports, some risk factors that can be detected during preoperative evaluation in the majority of isolated cases or small series have been

Image 1. The passing of the nephrostomy catheter through the ascending colon is shown.

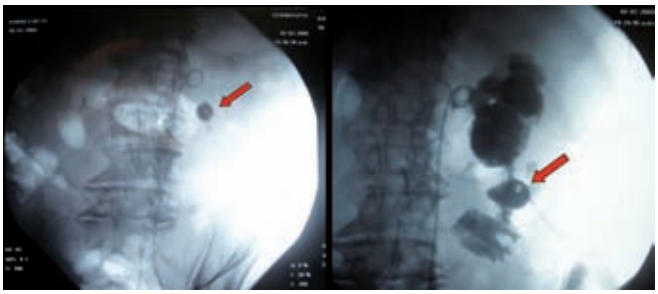

Image 2. Under fluoroscopic guide, after ureteral catheter, nephrostomy catheter is tractioned toward the opening of the colon and converted into a colostomy catheter.

Table 1. F Colonic perforation risk factors during PCN

- Horseshoe kidney
- Advanced age
- Colonic distension
- Intestinal diversion surgery
- Female sex
- Extremely thin patients
- Previous kidney surgery
- Severe scoliosis or myelomeningocele
- Transplanted kidney

identified (**Table 1**). In addition, colonic injury incidence is greater on the left side when there are punctures toward the inferior and/or very lateral calyces.[7]

Some authors, based on a series of cases, found that the most important and statistically significant risk factors are advanced age and the presence of horseshoe kidney.[8] This may be attributed to inadequate posterior position of the colon in elderly patients due to a reduced quantity of perinephric fat. Also, abnormalities in the retroperitoneum in cases of horseshoe kidney are the result of a defect in the normal development of the lateroconal fascia combined with the absence of the kidney in its normal position that provokes posterior colon displacement.[9]

PREVENTION

The key point is to identify those patients presenting with one or more of the above-mentioned factors as high-risk patients. There may be an atypical relation of the kidney with its adjacent organs and so a CAT scan should be done as part of the preoperative evaluation in order to determine safe access sites and to clearly identify the position of the colon adjacent to the affected kidney.[10,11]

Diagnostic approach in a patient suspected of having urolithiasis with simple CAT scan as the initial imaging study has several advantages: in addition to providing detailed information on the renal anatomical relation that can have an influence in puncture selection, it has been shown to be superior compared with excretory urography in the evaluation of patients with acute pain, showing the extension, orientation, localization and density of the calculus.[12] If CAT is available, ascending and descending colon should be considered in all cases for the purpose of assuring that retroperitoneal colon is not in a posterolateral or retrorenal position (**Image 3**). Once retrorenal colon is identified percutaneous puncture guided by standard fluoroscope can be unsafe due to the impossibility of intraoperatively identifying the adjacent intestine. In these cases, puncture assisted with ultrasound or guided by tomography can be advantageous.[13] The same is applicable to transplanted kidneys. Supine position (Valdivia or its modifications) can also be an alternative. There is 0% reported incidence of colonic injury in PCNL in this position.[14] Cormio et al.[15] argued that when the patient is in ventral position the colon is displaced against the lateral surface of the kidney, increasing the possibility of colonic injury as opposed to supine position in which the colon falls anteromedially and therefore far from the puncture zone (**Image 4**).

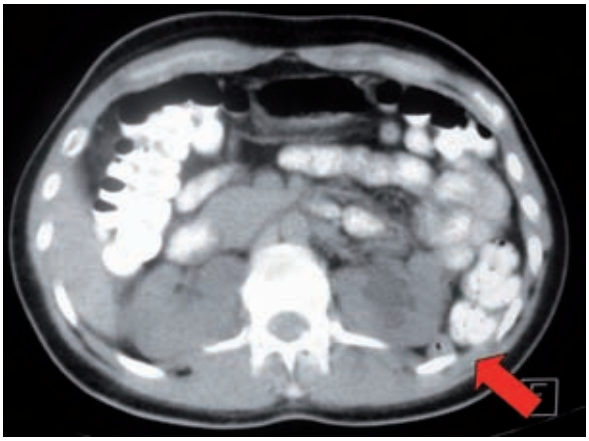

Image 3. Sagittal CAT image showing the retrorenal position of the descending colon.

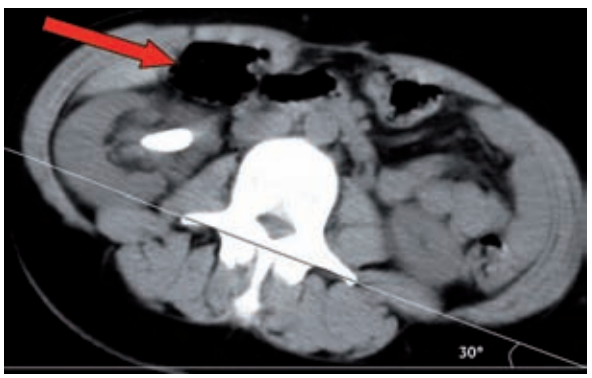

Image 4. CAT image with patient in the supine (Valdivia) position showing anteromedial displacement of the ascending colon.

DIAGNOSIS

Colonic injury should be taken into account if the patient presents with hematochezia in the intra- or postoperative period, signs of peritonitis or escape of gas or fecal material from the nephrostomy tract. It may be useful to carry out antegrade nephrostography at the end of PCNL to identify inadvertent colonic perforation.

This complication should be ruled out in high risk patients that present with fever, which is the most frequent sign,[16] or unexplained postoperative sepsis. Today the best diagnostic tool is abdominal CAT which clearly documents the passing of the nephrostomy catheter through the adjacent colon. If the patient develops a nephrocolonic fistula after the nephrostomy tube is removed, retrograde ureteropyelography is an alternative method for confirming diagnosis.

TREATMENT

Approximately 85% of colon injuries during PCNL can be managed conservatively[17] and this should always be the first treatment option as long as the perforation is retroperitoneal and the patient does not develop signs of peritonitis or sepsis. After diagnosis, the first step in the treatment is to eliminate nephrocolonic communication and decompress the urinary tract. This is achieved by placing a ureteral catheter and tractioning the nephrostomy tube toward the opening of the colon transforming it into a colostomy. In addition the patient should be put on a wide-spectrum antibiotic regimen and low-fiber diet.

Colonic catheter should remain until the colocutaneous tract is closed. Then within 7-10 days a contrasted study through the colostomy tube should be carried out and if there is no evidence of nephrocolonic fistula the catheter can be removed.[4,18]

Open surgical management with primary closure or resection and anastomosis is reserved for patients with intraperitoneal perforation with signs of peritonitis or sepsis or in those patients in which conservative treatment fails.

Late diagnosis of nephrocolonic or colocutaneous fistula can require the creation of a colostomy to promote fistulous tract closure. [19,20]

CONCLUSION

In spite of its low frequency, the possibility of colonic perforation should always be kept in mind. One of the most important preventive measures is adequate preoperative evaluation and the detection of high risk patients. Early diagnosis and treatment is extremely important. The majority of cases can be managed conservatively; however, very strict vigilance should be carried out to detect any sign of major complications such as peritonitis or sepsis. If that is the case, open surgical treatment should be performed with primary repair or intestinal diversion, depending on the severity of the injury.

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